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## Specification

## Printing Presses Comprising at Least One Printing Cylinder

The invention relates to printing presses having at least one forme cylinder in accordance with the preamble of claims 1, 3 or 10.

A method and a device for operating a single- or multi-color printing installation, preferably a printing press of satellite construction, is known from DE 34 46 619 A1, which has at least one first stationary machine group with a counterpressure cylinder and preferably four transfer cylinders, as well as at least one second displaceable machine group having at least an arrangement consisting of a forme cylinder, an inking unit and a dampening unit, wherein an arrangement of a forme cylinder, an inking unit and a dampening unit is assigned to each transfer cylinder. The displaceable machine group contains all arrangements in a common frame, so that all its forme cylinders can be simultaneously brought into contact or out of contact with their assigned transfer cylinders. A printing forme changing device working together with a forme cylinder is not provided.

A multi-color sheet-fed rotary printing press is known from DE 1 169 959 B1, wherein an inking unit can be moved away along an inclined track from the assigned forme cylinder of a printing group fixedly arranged in place in the printing press. Here, too, no printing forme changing device working together with a forme cylinder is provided.

A printing group with a central frame section and with two lateral frames, which are arranged on opposite sides of

the central frame section and are movable, in particular displaceable, is known from DE 102 21 330 A1, wherein forme cylinders and associated transfer cylinders are arranged in the central frame section, and inking systems, which are assigned to the forme cylinders, are arranged in the lateral frames wherein, in an operating state in which the lateral frames are moved away from the central frame section, i.e. are separated, a printing forme changing device is brought into an operative position in respect to a forme cylinder in place of an inking unit placed against this forme cylinder, wherein a motor-driven mechanism, preferably a linear motor, is provided for the lateral frames, and a drive unit for moving the printing forme changing device, wherein the movements of the inking unit and of the printing forme changing device occur independently of each one after the other.

The object of the invention is based on producing printing presses with at least one forme cylinder, wherein an inking unit and a printing forme changing device can be alternatingly placed against the forme cylinder or moved away from it.

In accordance with the invention, this object is attained by means of the characteristics of claims 1, 3 or 10.

The advantages which can be gained by means of the invention consist in particular in that it is not necessary to provide an inking unit as well as a printing forme changing device simultaneously in the structural space immediately adjoining the printing group, i.e. in the movable sections of the printing press. Since in the course of operating the

printing group either only the printing forme changing device or only the inking unit are simultaneously placed into contact with the forme cylinder, these two devices can be alternatingly brought into engagement with the forme cylinder to which they are assigned. It is advantageous if the movement of the printing forme changing device is coupled with the inking unit, because in that case the printing forme changing device does not require its own transport device and no drive mechanisms, which leads to a simplification and cost reduction of the printing press. If individual drive mechanisms are yet provided, these are advantageously connected by a common control in such a way that the printing forme changing device and the inking unit sequentially or together perform movements which are matched to each other.

Exemplary embodiments of the invention are represented in the drawings and will be described in greater detail in what follows.

Shown are in:

Fig. 1, a lateral view of a printing press with a stationary element and two movable elements, wherein inking units arranged in the movable elements have been placed against forme cylinders of the printing group arranged in the stationary element,

Fig. 2, a lateral view of the printing press from Fig. 1 with a stationary element containing a printing group and two movable elements containing inking units moved away from the latter,

Fig. 3, a basic sketch of the stationary element of the printing press with two movable elements, which have been

placed against the stationary element, wherein each of them works together with a printing forme changing device,

Fig. 4, a basic sketch of the stationary element of the printing press with two movable elements, which have been moved away from the stationary element, so that a printing forme changing devices has been placed against each one,

Fig. 5, a portion of a lateral view of the printing press from Fig. 1 with four printing forme changing devices placed horizontally against the stationary element,

Fig. 6, a portion of a lateral view of the printing press from Fig. 2 with four printing forme changing devices placed against the stationary element in a star shape,

Fig. 7, a basic sketch of the stationary element of the printing press with a movable element placed against it, on which a printing forme changing device has been fixedly attached,

Fig. 8, a basic sketch of the stationary element of the printing press with a movable element moved away from it, so that a printing forme changing device has been placed against it in its stead.

A printing press 01 is shown by way of example in Figs. 1 and 2, in this case a sheet-fed rotary printing press with a stationary element 02, wherein a printing group is arranged in the stationary element 02, which contains two transfer cylinders 03, 04, which roll off on each other in accordance with the rubber-to-rubber principle and work together with respectively four forme cylinders 06, 07 arranged in a satellite construction. Therefore the printing press 01 has a printing group for imprinting the front and back. It can

imprint two sides of a material to be imprinted simultaneously, for example in four colors.

In the embodiment shown by way of example, three dressings, in particular rubber printing blankets, can be placed one behind the other in the circumferential direction on the transfer cylinders 03, 04 of the printing press 01. The forme cylinders 06, 07 are each covered in their circumferential direction by a single dressing, in particular a printing forme. In their axial direction, the transfer cylinders 03, 04 as well as the forme cylinders 06, 07 have at least one dressing.

The printing press 01 has at least one element 08, 09, which is movable in the manner of a carriage and in which at least one inking unit 11, 12 is arranged, wherein the inking unit 11, 12 with its associated roller arrangement is assigned to a forme cylinder 06, 07 and can be brought into engagement with it. In the example shown, two movable element 08, 09 are provided, wherein each one of these movable elements 08, 09 can be placed against or away from the forme cylinders 06, 07 on a side of the stationary element 02 extending axially in respect to the forme cylinders 06, 07. Fig. 1 shows the movable elements 08, 09 in their state in which they are placed against the stationary element 02 and indicates in a dash-dotted representation the position of the movable elements 08, 09 in their moved-away state.

Preferably the same number of inking units 11, 12 corresponding to the number of forme cylinders 06, 07 is provided in each movable element 08, 09. However, dampening units assigned to the inking units 11, 12 in particular can

also be located in the movable elements 08, 09 of the printing press 01, which have not been represented in Figs. 1 and 2 for the sake of clarity. But it is easily conceivable that, because of the required arrangement of rollers in particular, dampening units would furthermore considerably reduce the limited structural space available in the movable elements 08, 09 and would in addition make the housing of further devices to be brought against the forme cylinders 06, 07, such as printing forme changing devices 26, 27, more difficult. Therefore Figs. 1 and 2 make it clear that the satellite type of construction of the printing group leads to very restricted space conditions in the movable elements 08, 09 if the goal is to bring devices into engagement with the forme cylinders 06, 07 arranged in the stationary element 02 of the printing press 01.

Each of the movable elements 08, 09 can be designed as frames, for example with frame walls located opposite each other, wherein all machine elements required for the devices to be arranged, such as inking unit rollers which are a part of the inking units 11, 12, ink fountains, etc. are attached, seated or fastened on the frame walls, i.e. in particular between them. The stationary element 02 of the printing press 01 can also include a frame with, for example, two oppositely located frame walls, in which the printing unit with all its cylinders is arranged. Thus, the frames constitute a mounting frame for diverse machine elements and combine defined machine components into a structural component or functional unit.

The movable elements 08, 09 of the printing press 01 are movable, for example in a translatory manner, by means of

transport devices 13, 14 assigned to them, i.e. are displaceable, wherein the movement preferably extends radially in relation to the forme cylinders 06, 07, as well as substantially horizontally in the direction indicated by the arrows x represented in Fig. 1. In an operational state wherein they are moved away from the stationary element 02, the movable elements 08, 09 of the printing press 01 take up a position represented in Fig. 2. The displacement path s of the movable elements 08, 09 can be 600 to 1000 mm, for example, preferably 800 mm.

It is furthermore possible to see from Figs. 1 and 2 that in the selected example of the printing press 01 the material to be imprinted is taken in the form of a sheet, preferably a sheet of paper, from a stack arranged in a sheet feeder 16 and is conveyed to the stationary element 02 of the printing press 01 by means of a first conveying device 17. Two cooperating drums 18 arranged in the stationary element 02 of the printing press 01 guide the material to be imprinted to the printing group, so that the material to be imprinted is passed between the two transfer cylinders 03, 04 and is thereafter picked up by a second conveying device 19, for example a chain conveyor 19 for placing the material to be imprinted, preferably in a stack, in a delivery device 21, i.e. at a location separated from the stationary element 02 of the printing press 01.

Printing forme changing devices 26, 27 are often employed for reducing set-up times, and therefore non-productive periods of the printing press 01, with whose aid one or several printing formes on a forme cylinder 06, 07 can be changed in that a printing forme no longer needed is

removed from a forme cylinder 06, 07 preferably automatically, i.e. in the course of a defined programmed process, and a fresh printing forme held in readiness by the printing forme changing device 26, 27 is applied to the forme cylinder 06, 07. However, with the described printing press 01 it is practically almost impossible to house the required printing forme changing devices 26, 27 required for the four forme cylinders 06, 07 in the movable elements 08, 09.

For this reason, at least one movably seated printing forme changing device 26, 27 is provided, which can be placed against or away from a forme cylinder 06, 07 alternatingly with an inking unit 11, 12. Here, the movements of the inking unit 11, 12 and the printing forme changing device 26, 27 are coupled with each other, i.e. the movements of the inking unit 11, 12 and of the printing forme changing device 26, 27 do not occur independently of each other, instead, the inking unit 11, 12 and the printing forme changing device 26, 27 are connected with each other by technical means, so that they inevitably act together in such a way that the movements of the inking unit 11, 12 and of the printing forme changing device 26, 27, which are aimed in opposite directions away from and toward the forme cylinder 06, 07, take place simultaneously.

For example, it is also possible to provide several printing forme changing devices 26, 27 in connection with every movable element 08, 09 of the printing press 01, wherein each one of the printing forme changing devices 26, 27 acts together with one of the inking units 11, 12 arranged in the movable elements 08, 09. The printing forme changing devices 26, 27

are preferably arranged on the driven side of the printing press 01.

The combined action of a printing forme changing device 26, 27 and an inking unit 11, 12 is represented by way of example in Figs. 3 and 4 in the form of simplified basic sketches. Figs. 3 and 4 show, each in a view from above, the stationary element 02 of the printing press 01, against both sides of which a movable element 08, 09 has been placed (Fig. 3), or has been moved away (Fig. 4). In this example each movable element 08, 09 is connected with at least one printing forme changing device 26, 27, wherein the printing forme changing devices 26, 27 each act together with an inking unit 11, 12 arranged in the movable element 08, 09 and are connected, for example by push rods 28, 29 seated in joints 31, 32, 33, 34, with the movable element 08, 09. If a movable element 08, 09 is moved away from the stationary element 02 of the printing press 01, i.e. if a movable element 08, 09 is moved by being displaced in the arrow direction x, as indicated, respectively one of the printing forme changing devices 26, 27 is placed against an associated forme cylinder 06, 07 in the stationary element 02 in place of the inking unit 11, 12. In this exemplary embodiment, the movements of the printing forme changing devices 26, 27 and the inking units 11, 12, which are arranged fixed in place in the movable elements 08, 09, are coupled with each other, so that they can be alternatingly placed against or away from the forme cylinder 06, 07.

For example, for one a mechanically operated guidance results with the aid of rollers 36, 37, 38, 39, arranged in

pairs and fixed in place in respect to the printing press 01, wherein push rods 28, 29, for example, are respectively guided in a gap between two rollers 36, 37, 38, 39. On the other hand, guide elements 41, 42 are provided, for example telescoping rails, on which respectively one of the printing forme changing devices 26, 27 is fastened. By moving a movable element 08, 09 in the arrow direction x, the printing forme changing device 26, 27 connected with it is forcibly displaced along the arrow direction y along the guide elements 41, 42. Because of this the printing forme changing device 26, 27 comes into engagement with its associated forme cylinder 06, 07. Then the printing forme changing device 26, 27 is in its working position, in which a printing forme can be exchanged between the forme cylinder 06, 07 and the printing forme changing device 26, 27. It is possible in a corresponding manner to return the printing forme changing device 26, 27 into its position of rest (Fig. 3), in the course of which an inking unit 11, 12 is again automatically placed against the forme cylinder 06, 07.

In a lateral view, Fig. 5 shows a portion of the printing press 01 represented in Fig. 1 with four printing forme changing devices 26, which have been placed against the forme cylinders 06 assigned to them in the stationary element 02. In the example shown in Fig. 5, the printing forme changing devices 26 are arranged horizontally and substantially parallel in respect to each other, at least in their working position. However, as already indicated in Fig. 2, in their working position the printing forme changing devices 26, 27 can also be aligned in a star shape, for example, in respect to the forme cylinders 06, 07 arranged in

the stationary element 02, as can be seen in Fig. 6, which represents an enlarged partial portion of Fig. 2.

Moreover, it is possible to provide, as represented in Figs. 7 and 8 in the form of simplified basic sketches, for the movable elements 08, 09 with the inking units 11, 12 arranged in them and the associated printing form changing devices 26, 27 to be fixedly connected with each other, wherein each rigid combination of a printing forme changing device 26 and an inking unit 11 can be displaced in the axial direction in respect to the associated forme cylinder 06, i.e. in the arrow direction y, so that the printing forme changing device 26 and the inking unit 11 alternately come into engagement with the forme cylinder 06 arranged in the stationary element 02.

It is common to the proposed embodiments that a defined inking unit 11, 12 and a defined printing forme changing device 26, 27 can always be brought into engagement with a defined forme cylinder 06, 07 to which they are assigned only in turn, i.e. alternately and not at the same time. For this purpose the movement required for bringing the inking unit 11, 12 into and out of contact is preferably coupled with the movement of the printing forme changing device 26, 27.

This coupling can advantageously be realized by means of a forced mechanical guidance device, so that a drive mechanism required for the movement of the inking unit 11, 12 is also used for the movement of the printing forme changing device 26, 27. The employment of the drive mechanism of the inking unit 11, 12 for the movement of the printing forme changing device 26, 27 is easily possible as a rule, because the inking unit 11, 12 is preferably arranged in a movable

element 08, 09 of the printing press 01, wherein the movable element 08, 09, which preferably consists of a frame with various roller devices arranged therein, has a very much greater mass than the printing forme changing device 26, 27 which is connected with it. The mass of the movable element 08, 09 and of the printing forme changing device 26, 27 can have a ratio of 30 : 1 or greater, for example. In actual operations, drive mechanisms of suitable output classes are used for the required mass acceleration, so that the drive mechanism made available for the movement of the movable elements 08, 09, and therefore of the inking unit 11, 12, has sufficient output reserves for easily taking on the movement of the printing forme changing device 26, 27 in addition.

On the other hand it is also possible to provide the printing forme changing device 26, 27 with its own drive mechanism for the movement, for example an actuating drive, whose control device takes into consideration the movement of the movable element 08, 09, so that a coupling of the movement is realized by means of the control device, wherein the control can take place, for example, electrically, electronically or pneumatically. Thus, the control device includes a preferably program-controlled run-off control which, for the individual drive mechanisms, takes into consideration the dependence of the movement of the printing forme changing device 26, 27 on the movement of the movable elements 08, 09, so that their movements, which are performed in sequence or simultaneously, are matched to each other as needed with the aim of reducing set-up times and therefore non-productive times of the printing press 01.

**List of Reference Symbols**

- 01 Printing press
- 02 Stationary element
- 03 Transfer cylinder
- 04 Transfer cylinder
- 05 -
- 06 Forme cylinder
- 07 Forme cylinder
- 08 Movable element
- 09 Movable element
- 10 -
- 11 Inking unit
- 12 Inking unit
- 13 Transport device
- 14 Transport device
- 15 -
- 16 Sheet feeder
- 17 Conveying device, first
- 18 Drum
- 19 Conveying device, second, chain conveyor
- 20 -
- 21 Delivery device
- 22 -
- 23 -
- 24 -
- 25 -
- 26 Printing forme changing device
- 27 Printing forme changing device

28 Push rod  
29 Push rod  
30 -  
31 Joint  
32 Joint  
33 Joint  
34 Joint  
35 -  
36 Roller  
37 Roller  
38 Roller  
39 Roller  
40 -  
41 Guide element  
42 Guide element

s Displacement path  
x Directional arrow  
y Directional arrow